



River SCIENCE

19

The science behind the Swan-Canning Cleanup Program

Issue 19, April 2001



Aquatic plants in the Canning River

A variety of aquatic plants live in the freshwater portion of the Canning River, upstream of the Kent Street Weir. This area is also monitored for water quality by the Swan River Trust, from the Kent Street Weir, Wilson, to the confluence of Yule Brook, Langford, a distance of 5 km.

Aquatic plants grow in wetlands, shallow lakes, rivers and all streams. They include phytoplankton (microscopic plants) and macrophytes, the larger plants that can be seen with the naked eye. Macrophytes include large algae, flowering plants and ferns. This River Science discusses only those macrophytes found in the upper Canning River.

There are many types of macrophytes

Macrophytes are often classified by their shape, and where in the water body they grow. Most

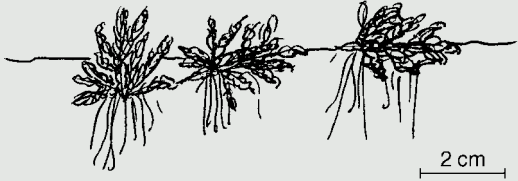
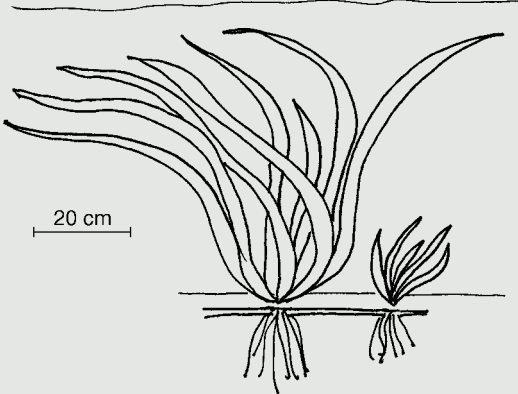
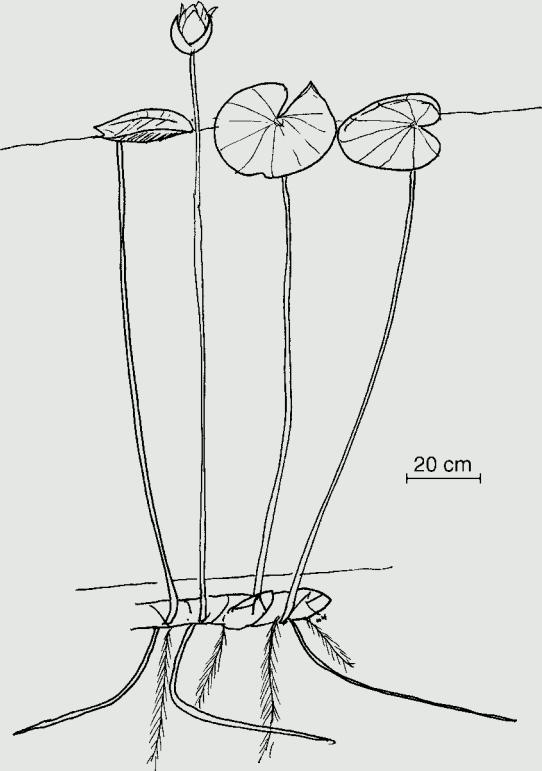
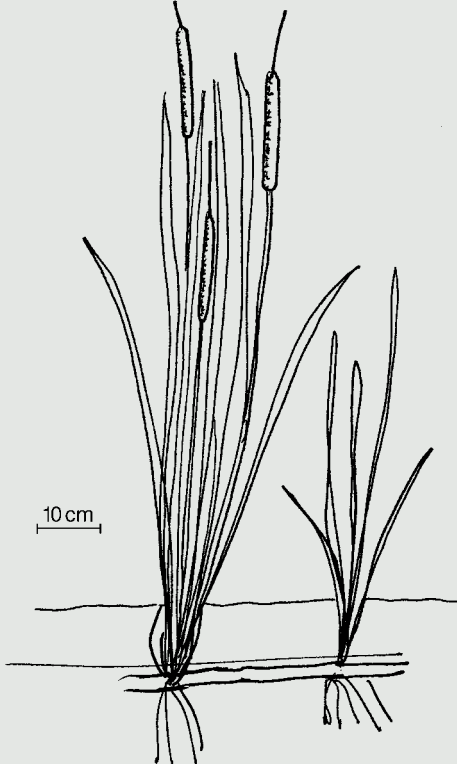
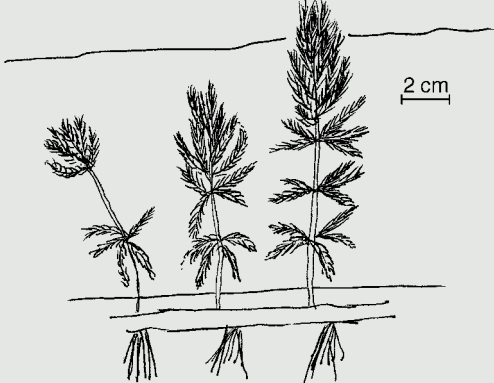
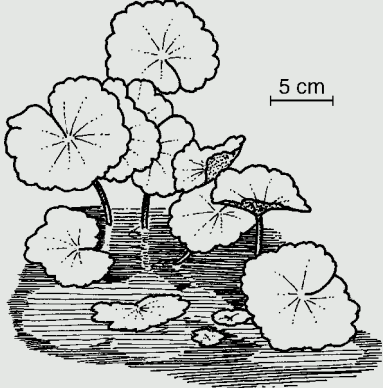
macrophytes are attached to the river bottom with their roots in the sediment but some are free floating with their roots floating in the water beneath them. The macrophytes that have their roots in the sediment can be submerged, with all their parts under the water, or emergent, with some of their structures above the water. Some submerged macrophytes have leaves or flowers that come out of the water for only a short period of time. Emergent macrophytes are often in the transitional zone, the area along the shoreline between the land and the water. They often buffer waterways by trapping sediments and taking up nutrients present in water flowing from the land.

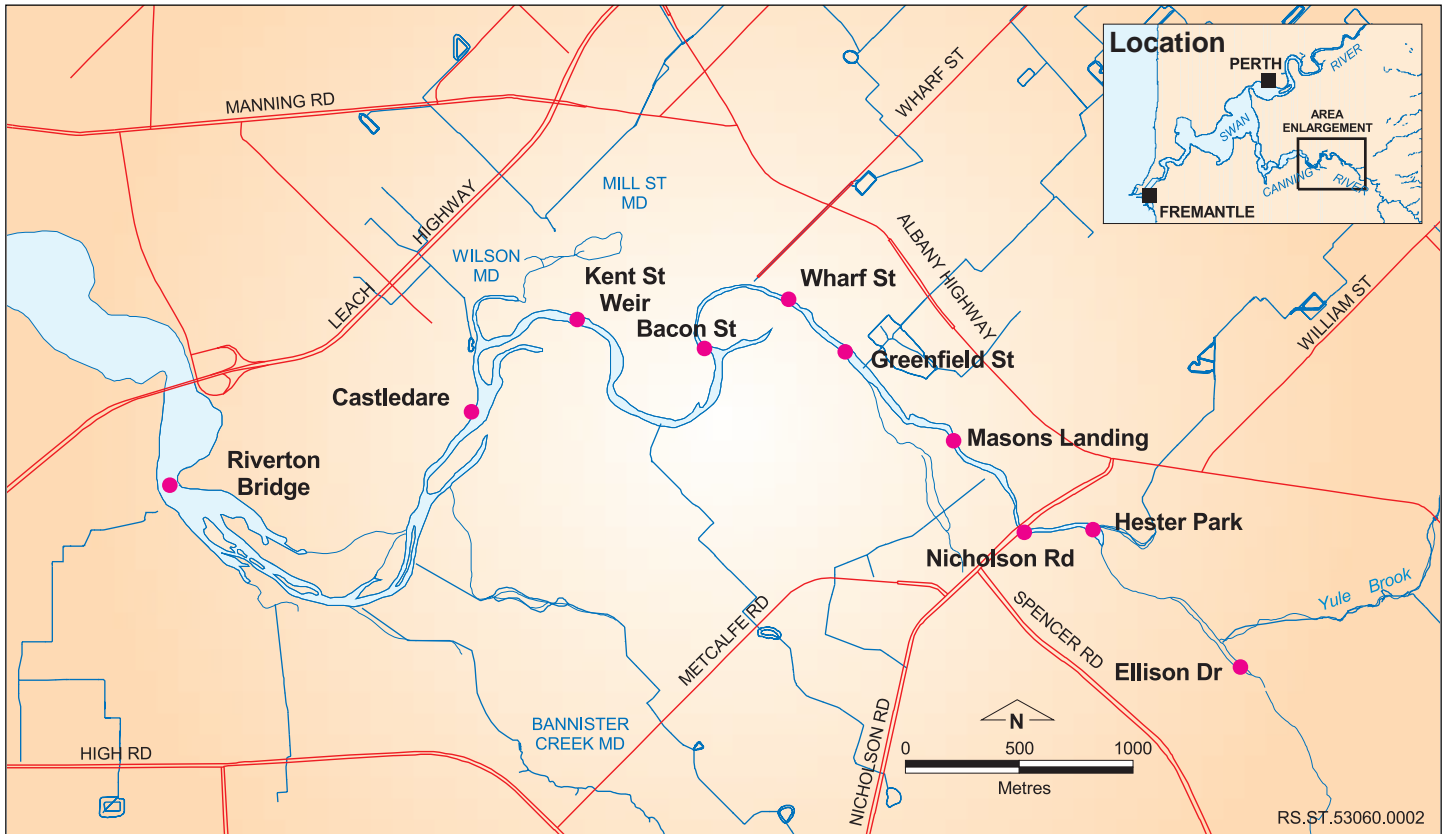
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Table 1. A classification of aquatic plants based on their shape and where in the water body they grow (Sainty and Jacobs 1994).

 <p>Free Floating e.g. <i>Azolla pinnata</i></p>	 <p>Submerged Not Feathery e.g. <i>Potamogeton</i></p>
 <p>Surface Floating e.g. <i>Nymphaeaceae</i></p>	 <p>Emergent Narrow Leaf e.g. <i>Typha</i></p>
 <p>Submerged and Emergent Feathery e.g. <i>Myriophyllum</i></p>	 <p>Emergent Broad Leaf e.g. <i>Hydrocotyle</i></p>



The Swan River Trust monitors water quality in the Canning River at Riverton Bridge, Castledare, Kent Street Weir, Bacon Street, Greenfield Street, Mason's Landing, Nicholson Road Bridge, Hester Park and Ellison Drive. Aquatic plants were observed in the freshwater portion of the Canning River, from the Kent Street Weir upstream to Ellison Drive.

There are over 13 species of aquatic macrophytes in the Canning River

There is a highly productive plant community in the freshwater portion of the Canning River, above the Kent Street Weir. It is a different environment from the estuarine portion of the Swan-Canning Estuary because of:

1. predominantly fresh water conditions,
2. slow to still flow conditions in summer and autumn and
3. nutrient rich waters.

With the exceptions of the ferns *Azolla pinnata* and *Salvinia molesta*, most of the macrophytes found in the freshwater Canning River are flowering plants. All categories of aquatic plants from the table are present except for the classification, Submerged and Emergent Feathery Plants. The assemblage is similar to other wetlands and waterways on the Swan Coastal Plain. The dominant macrophyte types have changed over the years in the Canning River, due to human activities. The main aquatic macrophyte species in the freshwater Canning River

between 1997–2001 were *Potamogeton*, *Azolla* and *Spirodela*. They showed the greatest biomass and distribution, and are likely to play very important roles in nutrient removal from the Canning River. In contrast, for short periods in the 1970s and 80s *Salvinia molesta* dominated the Canning River, and in the early 1990s *Hydrocotyle rununculoides* covered a large portion of the Canning River.

Submerged – not feathery macrophytes



The submerged plant *Potamogeton crispus* growing on the edge of the Canning River near Greenfield Street Footbridge. Photograph courtesy of Kathryn McMahon.

Common name: Curly pondweed

Scientific name: *Potamogeton crispus*
(Family Potamogetonaceae)

Distribution: Slow moving water bodies, coastal and inland rivers and creeks in all mainland States.

Potamogeton crispus is a native plant that grows both as an annual and as a perennial in the Canning River. It is a useful plant being a favourite food of ducks and providing a habitat for fish. The plant has flat, branched stems up to 3 m long but usually around 1 m. Leaves are up to 10 cm long with undulating margins. In the Canning River it is usually located on the river margins up to 2.5 m deep. In some locations it is present all year round (perennial), however most plants begin to grow in October, flower in December through to February and start to die back in January (annual). *Potamogeton crispus* flowers and sets seed. The inflorescence (stalk of flowers) emerges from the water in a spike with 10 to 15 flowers. It also produces a unique structure called a turion. These are modified leaves that act like buds. The turions drop to the bottom of the river and remain there over winter. In spring a new plant will develop from the turion.



The submerged plant *Vallisneria americana* growing on the edge of the Canning River near the mouth of Yule Brook. The milky brown colour of the water is common when the river is flowing in winter and early spring. Photograph courtesy of Kathryn McMahon.

Common name: Eel weed or Ribbon weed

Scientific name: *Vallisneria americana*
(Family Hydrocharitaceae)
formerly *Vallisneria gigantea*

Distribution: Stationary to fast-flowing waters of both coastal and inland river systems in all States.

Vallisneria americana is a perennial, native plant. It commonly grows in calm to fast flowing waters. In the Canning River it is located upstream of the Nicholson Road Bridge, growing on the edge of the river in shallow water up to 2 m deep, and is especially dominant near the mouth of Yule Brook. The flat leaves grow up to 1 m long and 5 cm wide. There is no branching and all the leaves grow from the base of the plant. It has a growth spurt in summer, following that of *Potamogeton crispus*. Small flowers are usually produced under water but little flowering has been observed in the Canning River. The lack of successful flowering is a symptom that has been noted in populations of *Vallisneria* species around Australia. In the natural environment

Vallisneria americana usually flowers in summer when the water level is low and the female flowers can reach the surface. However, with the human induced changes in stream flow through damming and other impoundments and water releases, water levels are often higher in summer than in winter. This interferes with *Vallisneria americana* breeding cycles.

Common name: Water thyme or Hydrilla

Scientific name: *Hydrilla verticillata*
(Family Hydrocharitaceae)

Distribution: Stationary and slow moving water bodies, coastal rivers and creeks, especially in warmer areas; all mainland States.

Hydrilla verticillata is an uncommon submerged macrophyte found in the Canning River. It is usually found as a perennial in calm and slow moving water bodies. In the Canning River, it is located in small patches upstream of the mouth of Yule Brook and around Mason's Landing. *Hydrilla verticillata* grows in diverse and balanced plant communities and will improve water quality by providing a food source and habitat for aquatic plants. It is a small plant, up to 80 cm long in the Canning River, but can grow to 2 m long. The leaves have toothed margins and form whorls of leaves along the stem. No flowering has been observed.



A picture of *Hydrilla verticillata* showing the form of the plant. Photograph courtesy of Geoff Sainty from Water Plants in Australia. (Sainty and Jacobs 1994).

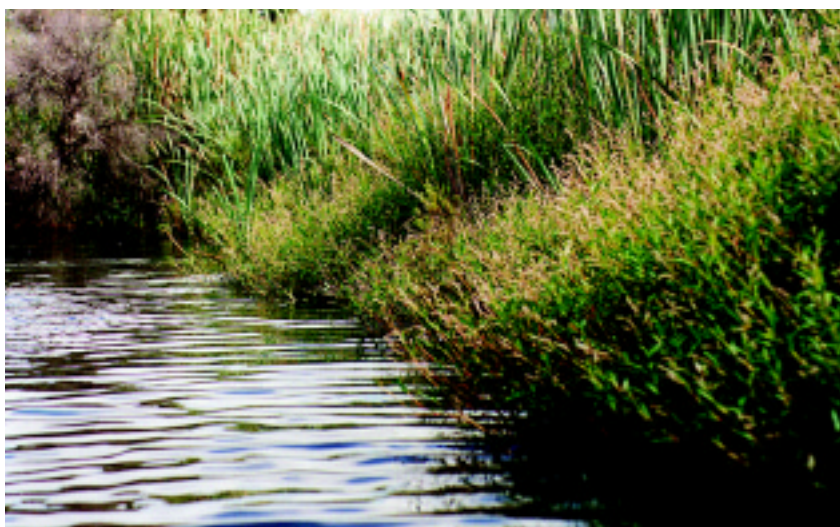
Emergent broad leaf macrophytes

Common name: Slender knotweed

Scientific name: *Persicaria decipiens*
(Family Polygonaceae)
formerly *Polygonum decipiens*

Distribution: Common on creek and river banks, margins of lagoons, swamps and channels on the coast and inland; all States.

Persicaria decipiens is a native, perennial plant that grows on the margins of the river. It is a useful component of wetland flora providing stability to river banks and habitat for small animals. It is common on creek and river banks, lagoons and swamps. In the Canning River the plant grows in 0.5 m to 1 m deep water and forms large patches up to 100 m long, especially near the Kent Street Weir. It is a summer growing plant with the greatest biomass and flowering observed from September through to March with natural dieback in winter.



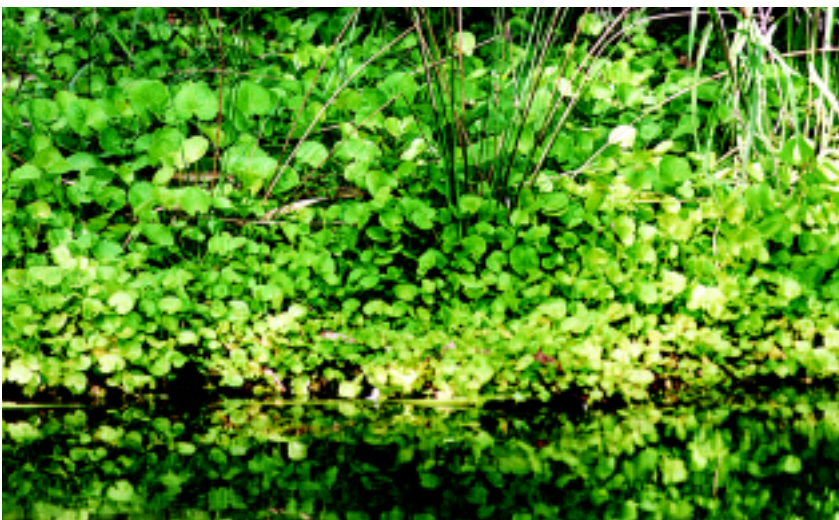
Photograph of a patch of *Persicaria decipiens* growing on the edge of the Canning River near Kent Street Weir and a close-up of the flowers. Photographs courtesy of Catherine Thomson.



The Declared Plant, *Sagittaria graminea* growing near Nicholson Road Bridge on the Canning River. Photograph courtesy of Catherine Thomson.



Hydrocotyle rununculoides growing on the edge of the Canning River. Photograph courtesy of Catherine Thomson.



The native plant *Centella asiatica*, growing along the edge of the Canning River. Photograph courtesy of Catherine Thomson.

Common name: Sagittaria

Scientific name: *Sagittaria graminea*
(Family Alismataceae)

Distribution: Static or slow moving water, banks of streams, periodically inundated areas such as drains; NSW, Qld, Vic. and WA.

Sagittaria graminea is a perennial plant found in static or slow moving water, often on the edge of streams. It was introduced to Australia from South America. The plant has two types of leaves, flat whorled leaves that are completely submerged and leaves that are triangular in cross-section and emergent. A few plants have been observed growing near the confluence of Yule Brook and the Canning River and near Nicholson Road Bridge. *Sagittaria graminea* is a Declared Plant by the Agriculture Protection Board of WA. This means that the plant has been identified as a noxious weed and must be eradicated. The Swan River Trust staff remove all plants from the Canning River whenever they are observed.

Common name: Hydrocotyle

Scientific name: *Hydrocotyle rununculoides*
(Family Apiaceae)

Distribution: Permanent freshwater streams and water storages of the coastal plain near Perth, WA.

Hydrocotyle rununculoides is another plant with Declared status. It is a perennial plant found in permanent freshwater streams, and is usually dormant over winter. It was first recorded in Australia in 1983 near Perth and in September 1992 it covered nearly 30% of a 7 km stretch of the Canning River above the Kent Street Weir. The plant has long stolons (root-like structures) with lobed leaves up to 10 cm wide. Small patches of the weed have been noted on the Canning River and are routinely removed from the waterway by Swan River Trust staff. This plant can be confused with the native plant *Centella* that is also found along the edge of the Canning River (see left).

Common name: Centella

Scientific name: *Centella asiatica*
(Family Apiaceae)

Former name: *Centella cordifolia*

Distribution: On the edges of freshwater water bodies and in winter-wet depressions, WA, Qld, NSW and Vic.

Centella asiatica is a creeping perennial herb that grows along the banks of the Canning River. It is a native plant that looks very similar to Hydrocotyle. Unlike Hydrocotyle, Centella does not grow out over the river but remains on the edge of the river in moist soil. The leaves are kidney shaped to almost round, 1 to 5 cm long and 2 to 10 cm wide. The edges of the leaves are slightly lobed or can also be quite smooth. The leaves are green but not as bright green as Hydrocotyle.

Common name: Taro

Scientific name: *Colocasia esculenta*
(Family Araceae)

Distribution: On the edges of freshwater water bodies and in poorly drained wet rainforest stands with adequate light at ground level; all mainland States.

Colocasia esculenta is a perennial, herbaceous plant. It is an agricultural crop in Africa, Asia, the West Indies, South America and the Pacific where the corms or yams (enlarged, underground stems) and young leaves are eaten. It is native to the Kimberley region of WA and has found its way further south. The plant is rooted in the ground with long petioles (leaf stems) up to 1 m high bearing large arrow-head shaped leaves approximately 60 cm long. The plant rarely sets seed and reproduces by cuttings or extension of the roots.

Colocasia esculenta is found along the entire length of the Canning River but is most prevalent around the mouth of Yule Brook. It has been increasing its distribution over the last 4 years and is considered a potential major weed problem.

Emergent narrow leaf macrophytes

Common name: Bulrush or Cattail

Scientific names: *Typha orientalis* and *Typha domingensis* (Family Typhaceae)

Distribution: Stationary or slow moving water bodies, margins of creeks and rivers of the inland and coast; all States.

Two species of *Typha* are present in the Canning River, *Typha orientalis* (cumbungi), an introduced species from the eastern States of Australia and *Typha domingensis* (syangnet), a native. In most water bodies in WA, *Typha orientalis* is considered

a weed. *Typha* is a perennial plant, usually found in fresh or brackish and stationary or slow moving water bodies. It is very important in aquatic systems because it provides food and a safe shelter for wildlife, especially aquatic birds. It also acts as an efficient nutrient and sediment filter for incoming

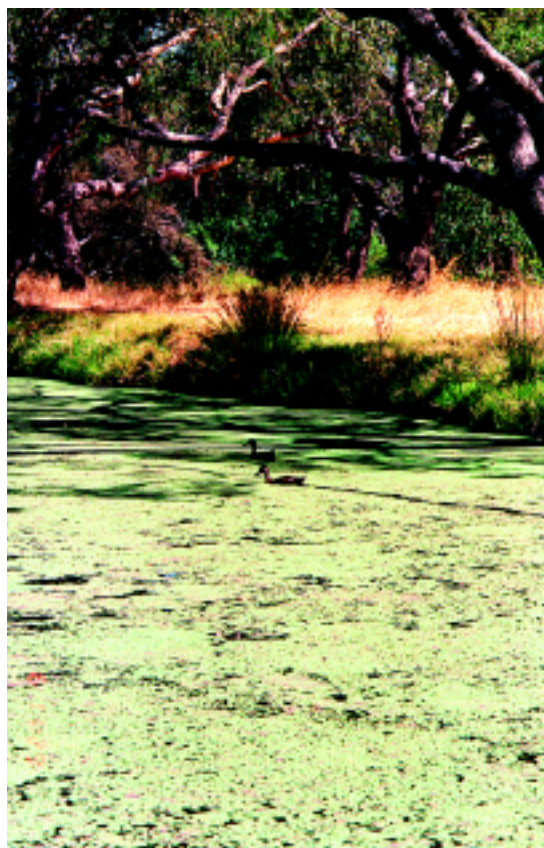


Colocasia esculenta growing on the edge of the Canning River. Photograph courtesy of Catherine Thomson.

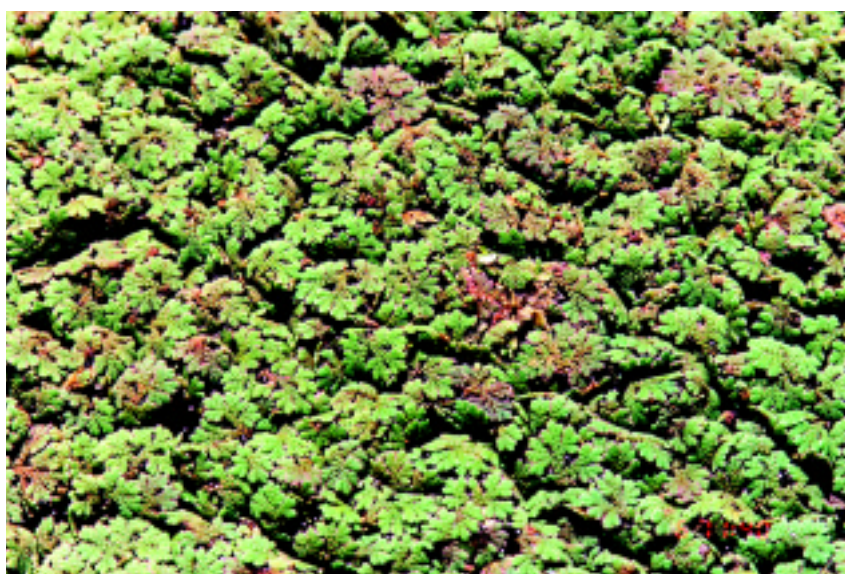


Two species of *Typha*, growing on the edge of the Canning River, *Typha orientalis* in the left foreground with darker green leaves and a larger inflorescence and *Typha domingensis* in the right background with lighter green leaves and a smaller inflorescence. Photograph courtesy of Catherine Thomson.

waters, stabilises river banks and prevents erosion in gullies. *Typha orientalis* often becomes established if water levels change and in water bodies with nutrient rich water. Dieback of *Typha* over the summer autumn period makes it prone to fire from which it readily regenerates. This gives it a competitive advantage over the neighbouring scorched vegetation.



A green carpet of *Azolla pinnata*, growing on the surface of the Canning River with a close-up of the cluster of small plants. Photographs courtesy of David Fardig.



The *Typha* species grow on the edge of the river in 0.5 m of water; they grow up to 2 m tall, though some plants can reach 4 m. *Typha* forms patches along the edge of the river between Kent Street Weir and Mason's Landing. The leaves are long and upright without branching, growing from a rhizome. The prominent feature of *Typha* species is the dense flowering spike produced in summer.

Free floating macrophytes

Common name: Azolla, Ferny azolla

Scientific name: *Azolla pinnata*
(Family Azollaceae)

Common name: Duck weed

Scientific name: *Spirodela* sp.
(Family Lemnaceae)

Distribution: Stationary and slow moving water bodies, especially if nutrient levels are adequate; all States.

Azolla pinnata is a native, floating fern. It is bright green in colour and about 2.5 cm wide but when it is exposed to the sun it often changes to a deep red colour. *Azolla pinnata* is unique in that it has a symbiotic relationship with a blue-green alga, *Anabaena azollae*. The blue-green algae are located in the small hairs on the underside of the fern and fix nitrogen gas from the atmosphere which is mixed into surface waters.

Spirodela sp. is also bright green and approximately 1 cm wide. It is a flowering plant. *Spirodela* and *Azolla pinnata* are often found together, floating on the surface of the entire length of the freshwater Canning River. Sometimes there are large patches up to 200 m long and on rare occasions up to 1.5 km long, that look like a green carpet on the river; otherwise they form small patches on the river surface. The plants are beneficial to the aquatic environment as they provide a food source for aquatic and terrestrial animals. Prolific growth of these species often indicates a nutrient enriched system and can be a problem in some waterways. River users often complain about this green carpet, and from a distance it can be confused with the scum of blue-green algae. However, the carpet of *Azolla* creates an environment that also discourages the development of water-borne blue-green algal blooms. *Azolla* restricts the sunlight that can penetrate into the water and hence blue-green algal

growth is limited. *Azolla* is regarded as an excellent nutrient remover or consumer and has been trialled in wastewater treatment ponds to remove nutrients from the water before they are discharged into the environment. Another interesting feature of *Azolla* is that it contains blue-green algae within its tissues. This is beneficial in phosphorus rich environments because *Azolla* can fix nitrogen from the air and take-up phosphorus from the waterway. It is also grown in rice paddies for its ability to fix nitrogen.

In the Canning River there have been occasions when thick coverings of *Azolla* have caused severe deoxygenation of the water column underneath the accumulations and strong sulfur smells have been associated with the decay of the dead plants. In nutrient enriched environments such as the Canning River, even the native aquatic plants can cause problems for humans with their prolific growth.

Common name: *Salvinia*

Scientific name: *Salvinia molesta*
(Family Salviniaceae)

Distribution: Stationary and slow moving water bodies, especially if nutrient levels are adequate; all mainland States.

Salvinia molesta is a floating fern introduced from South America. It is another plant Declared by the Agriculture Protection Board of WA as a noxious weed. It is found in stationary and slow moving water, especially in nutrient enriched conditions. The whole plant is about 20 cm long with leaflets 0.5 cm to 3 cm wide. This plant has been found in small numbers in drains that lead into the Canning River.

Surface floating macrophytes

Common name: Waterlily

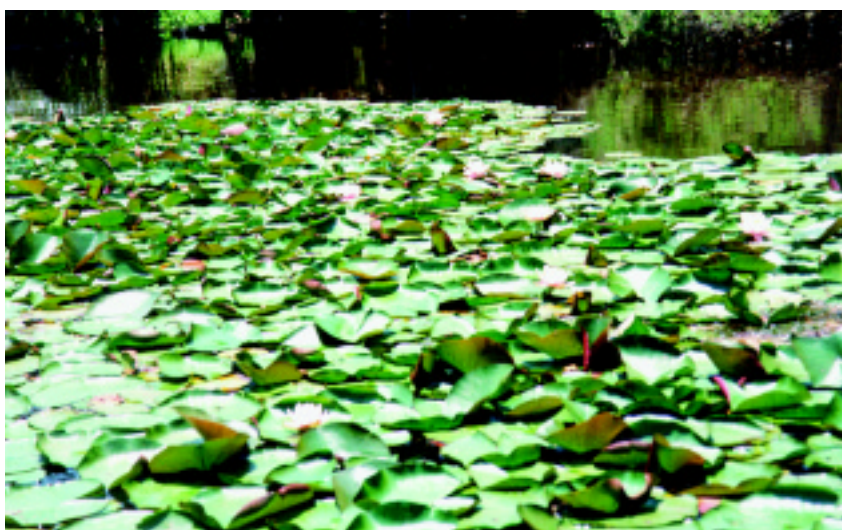
Scientific name: *Nymphae* sp. cultivar
(Nymphaeaceae)

Distribution: In water 1-3 m deep in lagoons and slow flowing creeks, in soft mud which may be a further 1 m deep; Qld, N. Territory and WA.

The waterlily found in the Canning River is a large, non-native, perennial macrophyte. It is a cultivar, a variety produced by cultivation. Its leaves are about 50 cm in diameter and float on the surface of the water. The leaves are attached to tubers and rhizomes in the sediment by long thin stems. It is found in

lagoons and slow-flowing creeks in water 1 m to 3 m deep and rooted in mud up to 1 m deep. The waterlily is found in two locations in the Canning River study area, near Mason's Landing and Hester Park, in water 1 m deep. Leaves die back in May and grow again in November, with flowering following shortly afterwards.

A close-up of the floating fern, Salvinia molesta. Photograph courtesy of Sainty and Jacobs from Water Plants of New South Wales 1981.



Nymphae sp. cultivar growing near Mason's Landing on the Canning River. Photograph courtesy of Kathryn McMahon.

Native aquatic plants are important elements of waterways

They enhance water quality in a number of ways:

1. They remove nutrients from the water and sediments and compete for nutrients with algae that form problematic blooms.
2. They reduce erosion by reducing river flows, by trapping suspended sediment and by stabilising the banks and beds of rivers.
3. They provide food directly or indirectly to aquatic and terrestrial animals such as fish, shrimp, freshwater crayfish, turtles and birds.
4. They provide a habitat for shelter and breeding to aquatic and terrestrial animals.
5. They provide dissolved oxygen to the water and sediments that support much of the aquatic fauna, and help control nutrient levels in the water.
6. They reduce turbidity by slowing the flow of rivers and causing particulates to settle out of the water column.
7. Macrophytes limit light penetration and water temperature and as a consequence restrict algal growth.
8. Macrophytes maintain habitat diversity and add aesthetic appeal to our waterways.

What about aquatic weeds?

The presence of macrophytes is generally an asset, but in some situations, with prolific growth, they may adversely affect the waterway. This is usually the situation with aquatic weeds. An aquatic weed is a plant that grows and reproduces rapidly in places where it is not wanted by humans, displaces other native species and generally threatens the natural function of waterways. Weeds generally displace desirable native vegetation by shading and reducing oxygen in the water, are aesthetically unattractive and can interfere with human utilisation of freshwater resources by choking waterways and reducing the efficiency of dams and irrigation systems. Outbreaks of aquatic weeds have occurred in the Canning River. For example, outbreaks of *Hydrocotyle rununculoides*

occurred between 1991 and 1993 and outbreaks of *Salvinia molesta* in 1972 and 1987. Other potential weeds recorded in the Canning River are *Egeria densa* (Common name Dense waterweed, Family Hydrocharitaceae) and *Eichornia crassipes* (Common name Water hyacinth, Family Pontederiaceae). Other Declared weeds present in the Canning River include *Sagittaria graminea* and *Zantedeschia aethiopica* (Arum lily).

To find out more about aquatic weeds in Western Australia refer to the Agriculture Western Australia brochure 'Weednote No 1/99' and the book, *Western Weeds, A Guide to the Weeds of Western Australia*.

Glossary

Annual plant – A plant that completes its life-cycle, from seed germination to seed production, followed by death, within a single year and often in a single season.

Assemblage – A group of living organisms found in a particular habitat, usually describing all the organisms in the habitat, such as the aquatic assemblage.

Brackish water – Water that is partly salty, not fresh and not as saline as seawater.

Confluence – Where a tributary joins a river or another tributary.

Declared plant – A plant that has been included in a list produced by the Agriculture Western Australia pertaining to the *Agriculture and Related Resources Protection Act 1976*. All plants in this list are high priority weeds that are or may become a problem to agriculture or the environment and are to be eradicated.

Emergent macrophyte – Species of aquatic plants that grow with roots in the sediment and have stems, flowers and most of the mature leaves protruding above the water surface.

Flowering plant – A classification of plants including all those that produce true flowers.

Fresh water – Water that contains very small concentrations of dissolved salts and is suitable for drinking

Macrophyte – A plant that is visible with the naked eye, including flowering plants, ferns, lichen, mosses and algae.

Native plant – A plant that originates from the country or place in which it is living, endemic to the area.

Particulates – Organic and inorganic compounds and matter that are not in solution in water, such as plant and animal debris, clays, sediment.

Perennial plant – A plant that continues to grow from year to year.

Phytoplankton – Microscopic, often less than 1-2 mm in diameter, usually single celled, free floating or weakly mobile aquatic plants, e.g. diatoms, dinoflagellates, chlorophytes, blue-green algae.

Plant – Any organism that photosynthesises and contains pigments that use light to produce sugars (energy), water and carbon dioxide.

Rhizome – An underground stem usually serving as a means of spreading itself and conducting water and nutrients to other parts of the plant.

Stolon – A horizontal stem that forms roots at the nodes.

Submerged macrophyte – An aquatic plant that has its roots in the sediment and whose leaves are normally fully under the water surface. Sometimes flowers emerge from the surface or leaves may be exposed if water levels change.

Transitional zone – A border area between different habitats where the conditions are changing, such as on the edge of a river where there is a change from aquatic to terrestrial plants.

Tuber – The swollen end of an underground stem which contains stored food and is an organ for vegetative propagation.

Turbidity – The measure of suspended particles in water which cause a reduction in light penetrating the water. In low turbidity water, the water is clearer than highly turbid water.

Turion – A detached winter bud which many aquatic plants produce and use to survive over winter.

Other useful references

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Native vegetation of freshwater rivers and creeks in south Western Australia. Water and Rivers Commission and Department of Conservation and Land Management, 1997.

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For more information

More information on aquatic plants and the Swan Canning Cleanup Program is available from the Swan River Trust.

Swan River Trust

Level 3 Hyatt Centre 87 Adelaide Terrace
East Perth Western Australia 6004

Telephone (08) 9278 0400
Facsimile (08) 9278 0401
Website www.wrc.wa.gov.au/srt

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